Application Of Cloud Computing In University Libraries

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Abstract

Technology is changing rapidly and is forming a layer that is touching each and every aspect of life like power grids, traffic control, medical and health care, water supply, food and energy and all the financial transaction of the world. Cloud computing is not an exception in changing the world. Cloud computing provides us virtually unlimited and on – demand computing resources. The infrastructure of cloud computing is such, that it encourages the development of innovation in every field. One such application of cloud is in university library .Emergence of cloud computing in libraries leaves us with many questions that are to be answered. The questions like:-

    1. How library can use the cloud to provide effective information to the users?

    2. How can the information be shared using the cloud?

This paper tries to answer such questions & provides a comprehensive introduction to the application of cloud in university libraries."The cloud is already there to burst only the library need to start thinking about how they may need to adjust services in order to effectively adapt to how users are interacting with it."

1. Introduction: "Cloud computing is a process that provides services on virtual machines that are allocated on the top of large physical machine pool." In Cloud Computing the information is permanently stored on the internet servers and it can be cached by the users temporarily. The name cloud computing has probably evolved from the cloud's image which is used to represent the Internet or any large network environment. Nobody really cares much about what is in the cloud? Or what happens there? The only thing of concern is that the data sending and receiving from it can be done reliably. Cloud computing can be related to higher level abstraction of the cloud. Services have now taken over from the usual data pipes, routers and servers. The basic hardware and software are still the integral part but the high level service capabilities are available to build the application. In the background of these services are the data and the resources. The user's main concern is not how the technology is implemented or what things are being used to manage this technology but the only concern is that how he can access it and what level of security is necessary to meet his requirements.

The cloud application is created using resources from more than one service and from more than one location. An application can be built using the resource from multiple services potentially and from multiple locations. To access the service you ought to know the end point, despite of the cloud providing you the available resource. It may also be termed as Software as a Service. There a grid of computer behind the service interface which provide the resources.

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A particular computer consisting of homogeneous environment of hardware and software host the grid. Thus it becomes easy to support as well as to maintain. Once you start paying for the services and the resources utilized, well that's utility computing.

Cloud computing is all about accessing services and resources that are along with present dynamically changing needs are needed to perform functions. A request is made to the cloud by the service developer or an application instead of any named resources or specific end point. Multiple infrastructures throughout multiple organization multiple organization are managed by what so ever goes in the cloud, hence it ties together one or more frame work that are overlaid on top of the infrastructure. Frameworks provide mechanisms for:

- self-healing
- self monitoring
- resource registration and discovery
- service level agreement definitions
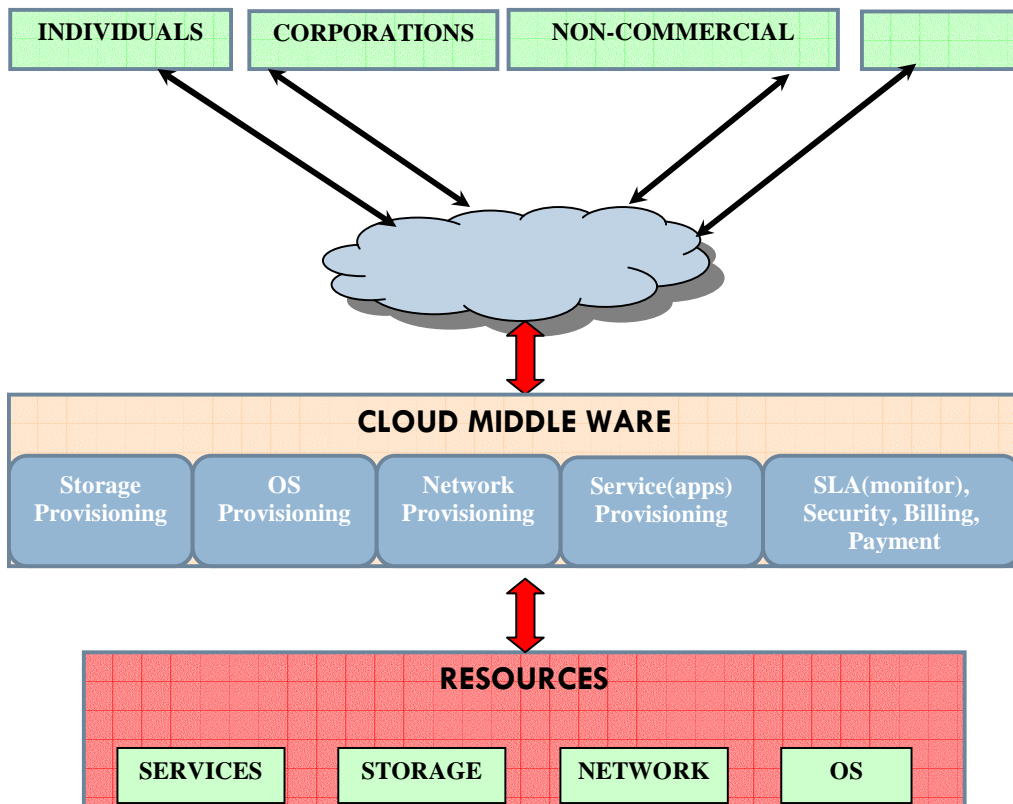- automatic reconfiguration

The cloud which is actually vertualisation of resources that manages and maintain itself. So as to keep hardware, operation system and networking in an orderly form there are provided people resources as well. But from the viewpoint of an application developer or a user, only the cloud is referenced. The Assimilator project provides a local cloud environment, it is actually a framework that in a local area network execute across a heterogeneous environment. In the works is the addition of a network overlay to start providing an infrastructure across the Internet to help achieve the goal of true cloud computing.

Imagine yourself as an executive in a large corporation. You are entrusted with the responsibilities which include to make sure that all of your employees are provided right hardware and software they may need to do their jobs. Purchasing computers for everyone isn't enough -- you have to purchase various software or **software licenses** to provide employees all those tools they require. Whenever you have a new employment, you have to buy more of the software or see to it that your current software license allows another user. It's so hectic that you feel it tough to go to sleep on your huge pile of money every night.

Soon, there may be a substitute for executives like you. Instead of installing a suite of software for every computer, you only need to load one application. That application shall allow workers to log into a Web-based service which hosts all the programs the user might need for his or her job. Remote machines owned by another company would run everything from e-mail to word processing to complex data analysis programs. It's called **cloud computing**, and it could result a change in the entire computer industry.

There's a significant workload shift in a cloud computing system. When it comes to running application Local computers no longer have to do all the heavy lifting. The network of computers that make up the cloud handles them instead. Hardware and software demands on the user's side decrease. The only thing the user's computer needs is to able to run the cloud computing system's **interface software**, that can be as humble as a Web browser, and the cloud's network takes care of the rest.

2.   Architecture:

INDIVIDUALS	CORPORATIONS	NON-COMMERCIAL	

CLOUD MIDDLE WARE

Storage Provisioning	OS Provisioning	Network Provisioning	Service(apps) Provisioning	SLA(monitor), Security, Billing, Payment

RESOURCES

SERVICES	STORAGE	NETWORK	OS

3.   Characteristics
   i) **Agility** – On demand computing infrastructure
      o   Linearly scalable – challenge
   ii) **Reliability and fault tolerance**
      o   Self healing – Hot backups, etc
      o   SLA driven – Policies on how quickly requests are processed
   iii) **Multi-tenancy** – Several customers share infrastructure, without compromising privacy and security of each of the customer's data
   iv) **Service-oriented** – compose applications out of loosely coupled services. One service failure will not disrupt other services. Expose these services as API's
   v) **Virtualized** – decoupled from underlying hardware. Multiple applications can run in one computer
   vi) **Data, Data, Data**
      o   Distributing, partitioning, security, and synchronization
      o

4.   Pros and Cons of Cloud Computing:
   i) Customers cannot own the infrastructure they are using, they can only rent it or can pay as they use.

ii) The major advantage of cloud computing is its less price.
iii) The companies can invest on lower technology based products and can focus on investing their money on goods and services they specialize.
iv) Location and device independence can be achieved that enables the users to access systems from any device and any location.
v) Cost and resource sharing between the users provides efficient savings like performance, load balancing, and even locations.
vi) It is reliable and scalable.
vii) The major concern is data security.
viii)   Improved resource utilization provides green and clean technology.

How Does It Works
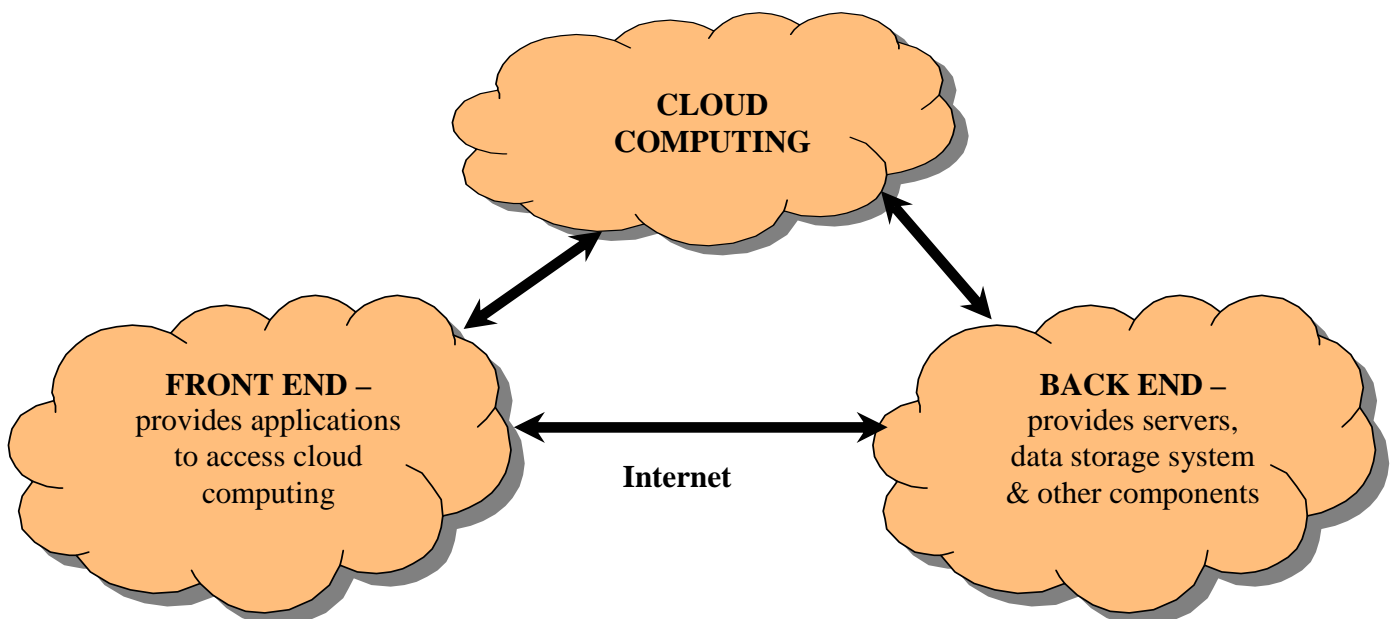
i)   Clients to access their applications and data from anywhere and anytime.
ii)   It can curtail the cost of hardware.
iii)   Companies need of physical storage space can be reduced.
iv)   Client has the advantage of processing power of the entire network.
v)   Compute and storage cloud architectures and implementations
vi)   Map-reduce and its generalizations
vii) Programming models and tools
viii) Novel data-intensive computing applications
ix)   Data intensive scalable computing
x)   Distributed data intensive computing
xi)   Content distribution systems for large data
xii) Data management within and across data centers

5.   Academic: By cloud computing education institutes can open their technology infrastructures to business and industries for helping in research advancements. Also they can pace up with the ever growing resource and energy expenditure. Its reach can help

the students to learn in different ways, perform their projects, manage their massive workloads, also helps them to understand new technology.

6.   How It Can Be Used In University Library? : The most important usage of cloud computing is in the university library where data can be used and shared with different universities and which in turn can help in effective utilization of the resources of library and research advancements. Basically cloud computing is drawing data and software applications from a network rather than locally from the workstations.

When connected to the cloud the digital libraries can become a large pool of data which can be a great help for colleges and research centers connected to that cloud. Library can use the technology by the service providers like GoogleDocs, Facebook, Flickr, Amazon etc. by paying a minimum amount. With the use of cloud the libraries can spent less amount on buying and maintaining the books etc. and other resources like hardware and networking infrastructure. Also the dependence on remote servers can be reduced.

In a state like ours if the concept of cloud computing is applied in the university library all the colleges that come under the university can be connected directly to the library cloud. All the information related to the library can be uploaded to the cloud and without worrying about the infrastructure colleges can access these information and the research paper. The cloud is cost efficient. But the major concern is security as some of the data cannot be given to third party datacenters (service providers). But the service providers are trying to incorporate the standards like SAS 70 Type II (Statement on Auditing Standards) and FISMA (Federal Information Security Management Act) for meeting the security needs of their clients.

7.   Conclusion: In today's inter institutional and globalised world cloud computing has found its relevance as it provides smooth and transparent operations. The university and college libraries can be connected without investing much on the infrastructure and also all the state universities can be connected.

"The cloud is already busted we only need to get ready to welcome the showers of knowledge and adapt it in our universities."

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